PATENT ABSTRACTS OF JAPAN

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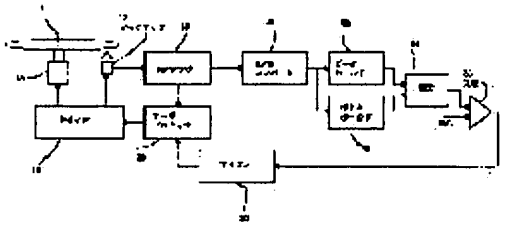
(71)Applicant : SONY CORP

(72)Inventor : SUMINO TORU

(54) OPTICAL DISK REPRODUCING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To cause a pickup to reliably escape from a mirror surface by discriminating whether the pick up is the region where musical programs or other information are recorded or the mirror surface based on the results of comparison between the level of the reproducing signal outputted from a signal generating means and a reference level.



SOLUTION: RF signals read out by a pickup 12 and amplified by a RF amplifier 13 are sampled by an A/D converter 31 to be converted to digital signals the peak and bottom values of which are held respectively by a peak- hold circuit 32 and a bottom-hold circuit 33. The difference between the peak value and the bottom value held by the two hold circuits is read by a difference circuit 34 and compared with a reference value Ref by a comparison circuit 36. By the comparison with the reference value, it is discriminated whether the Ref signal has been read from the information recording region or from the mirror surface.

LEGAL STATUS

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the optical disk regenerative apparatus which more specifically prevented the overrun of an optical pickup about the optical disk regenerative apparatus which reads information in the optical disk with which information was recorded optically.
[0002]
[Description of the Prior Art] In the optical disk regenerative apparatus which reproduces information from optical disks, such as a mini disc (MD) which is recording information with the compact disk (CD) or the pit gestalt, an optical pickup can apply a tracking servo based on the signal read in the record section of an optical disk, and follows the code track. There is a field called the mirror side where information is not recorded at all in the most inner circumference and the outermost periphery of an optical disk. If an optical pickup is positioned in a mirror side at the time of a start, or it is moved by causes, such as vibration, at the time of normal actuation and goes into a mirror side, since there is no signal read, in order that a tracking servo may not work, an optical pickup will be right and left unsteady. Moreover, since PLL (phase locked loop) which generates the clock which controls rotation of the spindle motor made to rotate a disk stops working, a spindle motor begins an overrun.
[0003] Although making it a mechanical device and preventing the trouble by the inner circumference mirror was performed by the former so that pickup might not start an inner circumference mirror side even if it moved the thread to the limit of the inside in order to prevent such a phenomenon, this approach does not become for solution of the problem at the time of pickup **** in a periphery mirror side. Even if pickup came to the periphery mirror side conventionally, when detecting this positively was not performed, but reading of data went wrong, what times carried out a retry and data were not still able to be read, judging that a mirror side has pickup and trying escape was performed.
[0004] Such a conventional approach required time amount for escape from the mirror side, and had a problem also in respect of certainty.
[0005]
[Problem(s) to be Solved by the Invention] Therefore, this invention aims at offering the optical disk regenerative apparatus equipped with the function to detect the mirror side of an optical disk.
[0006] Moreover, this invention aims at offering the optical disk regenerative apparatus it was made to extricate from pickup certainly from a mirror side.
[0007]
[Means for Solving the Problem] The optical pickup to which the optical disk regenerative apparatus of this invention irradiates light at the optical disk which has the 1st field where information was recorded, and the 2nd field where information is not recorded, A signal generation means to detect the reflected light of the above-mentioned optical disk, and to generate a regenerative signal from the detected reflected light, It has a distinction means to distinguish whether the above-mentioned optical pickup is located in the 1st field of the above based on the comparison result of a comparison means to compare the level and reference level of a regenerative signal from this signal generation means, and this comparison means, or it is located in the 2nd field of the above.
[0008] Typically, the 1st field is a field which is recording the information on a music program and others with the gestalt of a pit, and the 2nd field is a mirror side where such a pit does not exist. When it is judged that the optical pickup is located in the 2nd field with the above-mentioned distinction means, predetermined distance

migration of the optical pickup can be carried out, and it can be made to escape from a mirror side.
[0009]
[Embodiment of the Invention] Hereafter, with reference to a drawing, the gestalt of implementation of this invention is explained by making the regenerative apparatus of a mini disc (MD) into an example.
[0010] 1. There are two kinds of the structures MD of MD, the magneto-optic disk which can be written in, and the optical disk to which information is recorded with a pit gestalt and made as for writing. The structure of the disk of a pit record gestalt is fundamentally the same as CD. As a cross section is shown in drawing 3 , it has the inner circumference mirror field 6 and the periphery mirror field 7 where the information record section 2 and information that information was recorded with the gestalt of a pit are not recorded. The information record section 2 is equipped with the prima SUTADO field which audio information etc. was digitized and was recorded by the pit pattern, the lead-in groove field 4 which records TOC (Table Of Contents) which is the information about the contents recorded on the prima SUTADO field, and the lead-out field 5 of a disk periphery.
[0011] Periphery mirror area size is decided by information area size. If the amount of the contents which a periphery mirror field will become large and will be recorded if the amount of the contents recorded on the disk of one sheet is small is large, a periphery mirror field will become small. Thus, the boundary of a periphery mirror field and an information field changes with amount of information currently recorded.
[0012] The disk of a bit record gestalt is typically created through the following process. Analog recording or the music which digital sound recording was carried out and was saved at the magnetic tape is edited into one disk (premastering). In the digital data which digitized this in the case of analog recording, and digital sound recording, the digital data It compresses using the audio compression technology called ATRAC (Adaptive Transform Acoustic Coding). Coding for error corrections (it CIRC(s)) It changes into the digital format which gave Cross Interleaved Reed Solomon Coding and eight-to-fourteen modulation (Eight to Fourteen Modulation), and was suitable for the disk. The digital information which should insert TOC in the first part and should be recorded on a disk is prepared.
[0013] Subsequently, a laser beam is used and exposed in the shape of [corresponding to this digital information for the original recording which applied the photoresist on the glass plate] a pit pattern. In this way, the original recording of the optical disk which develops the exposed original recording and has a pit pattern in a front face is formed (mastering).
[0014] If it explains simple, a metal mask will be created by the principle of mold push from the original recording formed in this way, and La Stampa used for the mass production of an optical disk through the process which makes a mother further will be created. La Stampa has the reverse pattern of the pit pattern formed in an optical disk on a front face. A stamp is carried out by the approach of pressing this in a transparent plastics layer, and the concavo-convex pit pattern of La Stampa is imprinted in a plastics layer. The metal membrane for reflection is attached to this plastics layer by approaches, such as vacuum evaporationo, a protective layer is further formed by hard resin on a metal membrane, appearance processing is carried out, and an optical disk is completed.
[0015] Reading of the information from an optical disk irradiates a laser beam from a transparent plastics layer side, and is performed by detecting the reflected light. Since it is the above structures, the mirror fields 6 and 7 where a pit pattern does not exist have structure which has a transparent plastics layer on the flat metallic reflection film, and if it sees from a plastics layer, i.e., optical pickup, side, they are mirror planes literally.
[0016] Although a mirror side exists also between the trucks of an optical disk, a tracking servo hears at the time of the usual actuation, and pickup is controlled to follow a truck with a pit.
[0017] 2. The basic configuration of MD regenerative apparatus is shown in system configuration drawing 2 . If a disk 1 is set in a regenerative apparatus, it will detect whether this disk is a magneto-optic disk or it is the optical disk of a pit record gestalt, and the playback mode doubled with the class of disk will be set up. That is, when a magneto-optic disk is set, the optical head 12, i.e., an optical pickup, operates by the laser output of a high level for heating a recording track to Curie temperature at the time of record, and in order for a magnetic Kerr effect to detect data from the reflected light, at the time of playback, it operates by the laser output of a low comparatively. Moreover, in the case of the optical disk with which the disk 1 is recording data as well as CD with the pit gestalt, an optical pickup 12 takes out a playback RF signal according to change of the reflected light level by the existence of a pit like CD regenerative apparatus instead of a magnetic Kerr effect. Thus, since the processing mode of a regenerative apparatus changes with classes of disk set, the set disk responding for

which type of thing being, and setting up a circuit is performed.
[0018] If a setup of a circuit is made, a microcomputer (henceforth a microcomputer) 20 gives a command to the servo processor 23, and a signal will be moved to a driver 19 and it will move delivery and pickup 12 at the beginning of the lead-in groove field 6 (drawing 3) of an optical disk 1. According to the RF signal which pickup 12 reads, the servo processor 23 doubles the focus of pickup 12 with the pit side of an optical disk, and establishes a focusing servo and a tracking servo.
[0019] It will be in the condition that data can be read now in an optical disk. First, the data of TOC are read in a lead-in groove field, and it incorporates in the memory of a microcomputer 20. If a command is told by button grabbing of a key 21 etc., a microcomputer 20 will compute the address where pickup should move by internal memory, and will take out a command to a driver 19. A driver 9 drives the thread which conveys pickup according to the command, and moves pickup to the location.
[0020] If it arrives at the destination, the information on the destination will be read by pickup 12, it will be amplified by RF amplifier 13, an EFM recovery, an error correction (CIRC decoding), etc. will be performed by the digital signal processor (it is called Digital Signal Processor and Following DSP) 4, compressed data will be elongated, and a digital audio signal will be reproduced. After storing temporarily in the shock proof memory 5, the reproduced digital audio signal is read, is sent to the digital-to-analog converter (D/A converter) 16, is changed into an analog wave and sent to an audio amplifier 17. A microcomputer 20 displays various information on the displays 22, such as LCD, during regeneration of a signal.
[0021] 3. In the example of the basic configuration of the above-mentioned regenerative apparatus shown in drawing 1 , the mirror side detection device of invention of mirror side detection ****** can also be materialized as an additional element with separate DSP14, although it is incorporable into DSP14.
[0022] Drawing 2 is drawing showing the judgment device of a mirror side in which this invention was followed, and the same reference number as drawing 1 has shown the same element as drawing 1 . The RF signal which was read by pickup 12 and amplified by RF amplifier 13 is sampled by the analog digital converter (henceforth an A/D converter) 31, it changes into a digital signal, the peak value is held in the peak hold circuit 32, and the bottom value is held in the bottom hold circuit 33. The difference of the peak value held in both hold circuits is taken in a difference circuit 34, and it compares in the reference value Ref and comparator circuit 36 which set up the value beforehand. This reference value Ref is set up sufficiently more greatly [it is smaller than the value of the peak pair peak of the RF signal usually read in the information field, i.e., the pit side, of an optical disk 1 enough, and] than the value of the peak pair peak of the RF signal read in a mirror side. By carrying out like this, a RF signal can distinguish by the comparison with a reference value in what was read in the information record section, and the thing read in the mirror side.
[0023] When drawing 4 is referred to here, this drawing shows the RF signal which pickup 12 read in the information record section, i.e., pit side, of an optical disk with a certain optical disk regenerative apparatus. As shown in this drawing, the values of the peak pair peak of a RF signal are 400 thru/or 600 millivolts. On the other hand, drawing 5 shows the RF signal which pickup 2 read in the mirror side of an optical disk with the same optical disk regenerative apparatus. As shown in this drawing, the values of the peak pair peak of the RF signal of a mirror side are 10 thru/or 20 millivolts. If a reference value is set to about 20% of the peak pair peak value of the RF signal read in an information record section, for example, 100 millivolts, in the case of this optical disk regenerative apparatus, a RF signal can distinguish from the comparison with a reference value and the value of the peak pair peak of a RF signal in the thing from the thing or mirror side from an information recording surface. These values are only examples to the last.
[0024] if it returns to drawing 2 -- the difference from a difference circuit 34 -- it is judged with a value being compared with a reference value Ref in a comparator circuit 36, and the information recording surface of an optical disk 1 having pickup 12, if larger than a reference value, and the usual actuation is continued. the difference from a difference circuit 34 -- if a value is smaller than a reference value, it will be judged with the mirror side of an optical disk 1 having pickup 12. A microcomputer 20 answers the output signal of a comparator circuit 36, and when it is shown that pickup has this output signal in the mirror side of an optical disk, it puts the escape actuation from a mirror side into operation.
[0025] Drawing 6 shows flow until it starts escape actuation from the mirror side by this invention from from, when setting a disk and starting a regenerative apparatus. If a disk is set in a regenerative apparatus, the class of disk will be detected as mentioned above, and it will be set up so that each IC of a regenerative apparatus may read pit record as it is the optical disk of a pit record gestalt (F101). This setup is made by reading the

adjustment value memorized by memory, such as EEPROM, and sending to each controller. This adjustment is indicated in detail by JP,8-77577,A.
[0026] After a setup finishes, rotation of a spindle motor 18 is started (F103), and it adjusts so that the focus of an optical pickup 12 may suit the pit field of an optical disk (F103), and a focusing servo and a tracking servo are operated (F104).
[0027] Subsequently, reading of a RF signal can start with the pit side of an optical disk. As shown in drawing 2 , the read RF signal is sent to A/D converter 31 for mirror side detection, while it is sent to regeneration by the conventional equipment configuration shown in drawing 1 . if it is judged in a comparator circuit 36 that the value of the peak pair peak of a RF signal is below the reference value Ref (F106) -- a microcomputer 20 -- a tracking servo -- OFF -- carrying out (F107) -- the servo processor 23 -- letting it pass -- a driver 19 -- a command -- a delivery thread -- the direction of inner circumference of an optical disk -- predetermined distance -- for example, it is made to move 5mm (F108)
[0028] Usually, since it is the mirror side of an optical disk periphery that pickup enters by malfunction of vibration and others, the migration direction of the thread for escape is set up in the direction which goes to the inner circumference of an optical disk. When it is the regenerative apparatus with which pickup may go into the mirror side of not only the mirror side of an optical disk periphery but optical disk inner circumference, When it is judged that prepare the register which makes the address to which it was read recently [of a thread or pickup], or migration was directed memorize, and pickup went into the mirror side by the comparator circuit 36, When that value shows near the periphery of an optical disk with reference to this register, the migration direction of a thread is made into the direction of inner circumference of an optical disk, and when that value shows near the inner circumference of an optical disk, the migration direction of a thread can be made into the direction of a periphery of an optical disk.
[0029] After carrying out predetermined distance migration of the thread, a tracking servo is turned ON (F109) and it returns to the step which looks at the judgment of a comparator circuit 36 about the RF signal which pickup 12 reads. When the level of a RF signal is still below a reference value, it goes into an escape process from a mirror side again, a tracking servo is turned OFF, and predetermined distance migration of the thread is carried out. With a movement magnitude [1st] one half extent of the direction of the 1st thread migration, for example, make it move 2.5mm in the opposite side of a periphery, i.e., the direction, is [this 2nd thread migration] good.
[0030] The reason carried out in this way is as follows. Even if pickup is moved to the information record section of an optical disk by the 1st thread migration, the level of the RF signal in which pickup has not borrowed in a tracking servo and will be read by the time of the next mirror side judging by the time of the next mirror side judging by the cause of being located in the mirror side between trucks by chance may not reach a reference value. In such a case, it is judged with a mirror side still having pickup. According to this judgment, if a thread is further sent in the direction of inner circumference like the 1st migration, past [delivery] will come. in this case, the case where it is judged that an information record section has pickup by that next mirror side judging, and it returns to normal actuation -- pickup -- a basis -- it being distantly [from the location of a ****** information record section] separated, moving pickup to the location of a basis, and resuming information reading will take time amount. In order to make it not become such a situation, it is [****** / return and / predetermined] good in predetermined ****** to bring near pickup by inner circumference gradually and to go for a while, repeating the actuation which returns for a while.
[0031] Of course, whenever a mirror side is detected by every [a predetermined distance small to an one direction / F106], for example, a step, instead of doing in this way, you may make it move 2.5mm thread in the direction of inner circumference. In this case, since the first pickup movement magnitude is small, the probability that it can escape from a mirror side in the first mirror side escape actuation falls compared with the approach of moving a thread greatly first.
[0032] If the above-mentioned actuation is repeated and the level of the peak pair peak of a RF signal exceeds a reference value until a RF signal exceeds a reference value, PLL will be turned ON and the usual actuation will be started. (F110) . This flow chart shows the period until it goes into normal operation from the start of a regenerative apparatus. After going into normal operation, mirror side detection actuation below RF-signal reading (F105) of drawing 6 is performed periodically, and shortly after a mirror side is detected, mirror side escape actuation is started. If pickup goes into a mirror side, information from an optical disk cannot be reproduced but supply of the data to the shock proof memory (RAM) 15 will stop. Detection actuation of a

mirror side is performed with the period with which an optical pickup escapes from a mirror side and can return to normal reading actuation, before the shock proof memory 15 becomes empty.

[0033] In addition, although the RF signal was digitized by the A/D converter and the value of a peak pair peak was compared with the reference value in order to detect a mirror side by description of the gestalt of implementation of the above invention A mirror side is also detectable by detecting the amplitude of a RF signal by the analog-technique which is made to charge a capacitor by the RF signal and looks at the level. Moreover, the envelope of a RF signal can be taken out, this envelope can be sliced and pulse-ized, and a mirror side can also be detected by comparing that magnitude with a reference value. Thus, this invention is not limited to the above-mentioned example.

[0034]

[Effect of the Invention] According to this invention, it is quickly detectable that the optical pickup of an optical disk regenerative apparatus went into the mirror side of an optical disk. It can be made to escape from pickup positively from a mirror side according to this detection.

[Translation done.]

CLAIMS

[Claim(s)]
[Claim 1] The optical pickup which is the optical disk regenerative apparatus which reproduces information from the optical disk which has the 1st field where information was recorded, and the 2nd field where information is not recorded, and irradiates light at the above-mentioned optical disk, A signal generation means to detect the reflected light of the above-mentioned optical disk, and to generate a regenerative signal from the detected reflected light, An optical disk regenerative apparatus equipped with a distinction means to distinguish whether the above-mentioned optical pickup is located in the 1st field of the above based on the comparison result of a comparison means to compare the level and reference level of a regenerative signal from the above-mentioned signal generation means, and the above-mentioned comparison means, or it is located in the 2nd field of the above.
[Claim 2] The optical disk regenerative apparatus according to claim 1 whose 1st field of the above is an information record section and whose 2nd field of the above is a mirror field.
[Claim 3] The optical disk regenerative apparatus according to claim 2 which carries out predetermined distance migration of the above-mentioned optical pickup when it is judged that the above-mentioned optical pickup is located in the above-mentioned mirror field with the above-mentioned distinction means.
[Claim 4] Migration of the above-mentioned predetermined distance of the above-mentioned optical pickup is the optical disk regenerative apparatus according to claim 3 which was made to be performed in the direction of inner circumference of the above-mentioned optical disk.
[Claim 5] Also even for after migration of the above-mentioned predetermined distance of the above-mentioned optical pickup, the 2nd migration of the above-mentioned pickup is the optical disk regenerative apparatus according to claim 4 with which it was [as opposed to / when the above-mentioned distinction means shows that the above-mentioned optical pickup is in the above-mentioned mirror field / the direction of a periphery of the above-mentioned optical disk] made to perform only distance smaller than the above-mentioned predetermined distance.
[Claim 6] It is the optical disk regenerative apparatus according to claim 1 whose above-mentioned regenerative signal is a RF signal and whose level of the above-mentioned regenerative signal is the value of the peak pair peak of a RF signal.

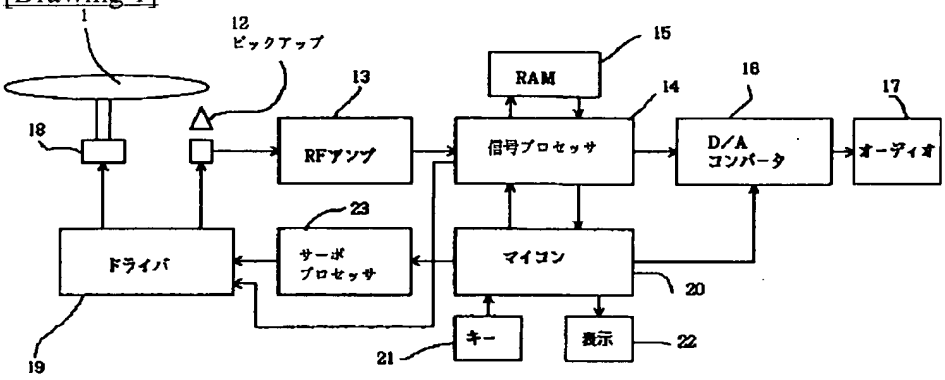
[Translation done.]

* NOTICES *

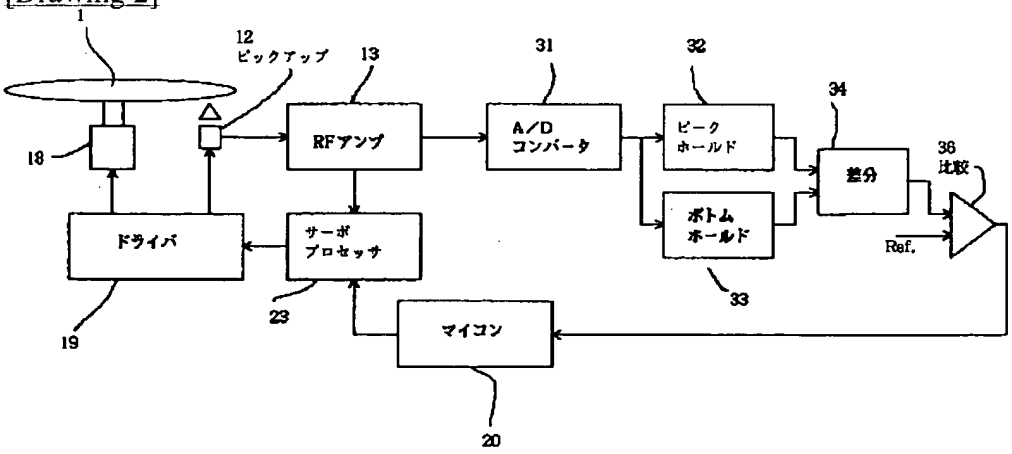
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

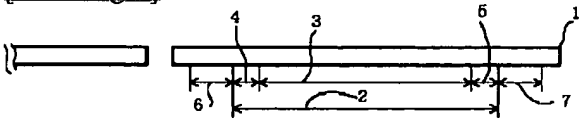
[Drawing 1]



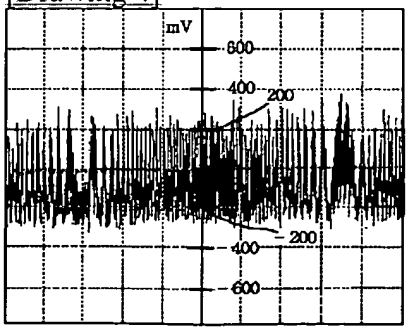
[Drawing 2]



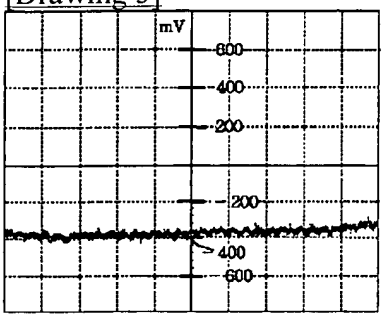
[Drawing 3]



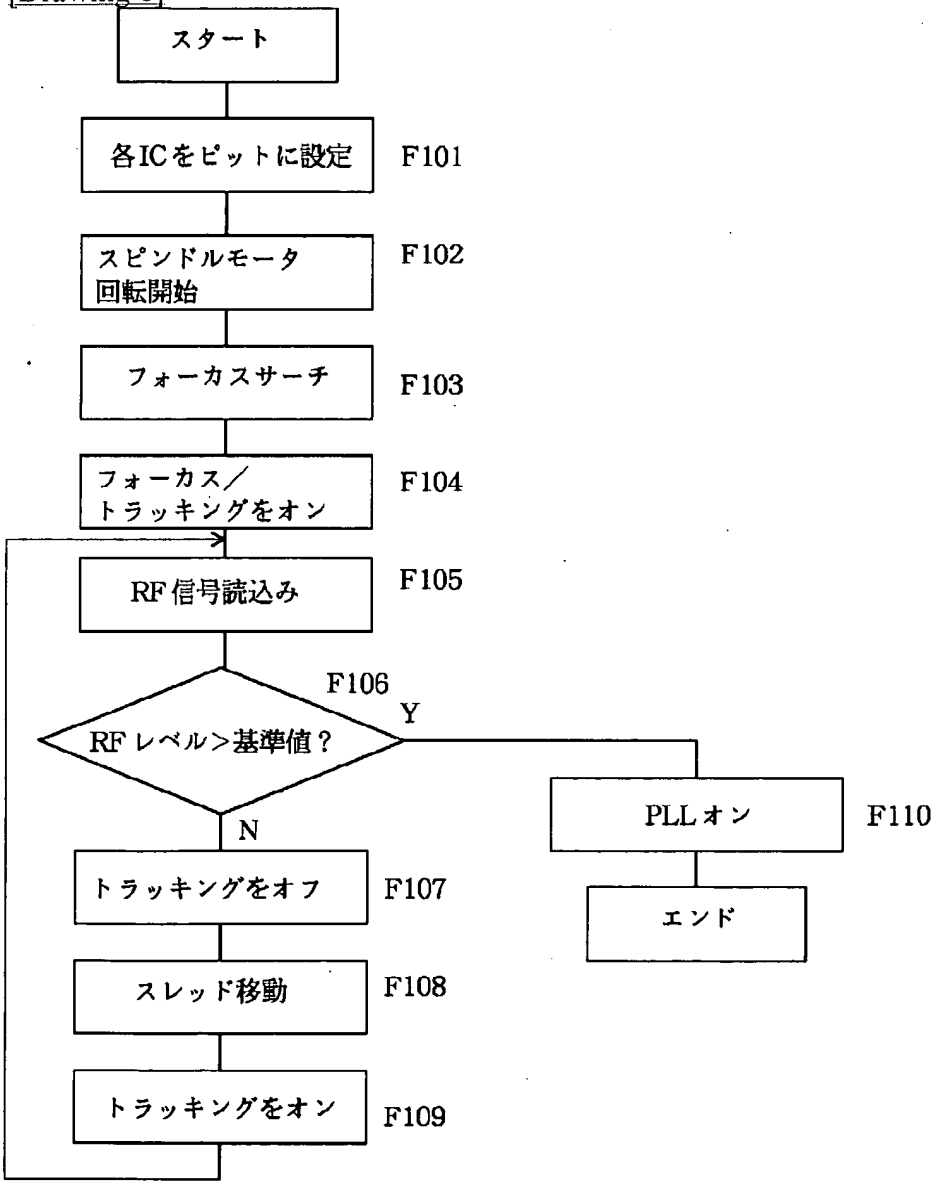
[Drawing 4]



[Drawing 5]



[Drawing 6]



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